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Defence and Civil
INSTITUTE OF ENVIRONMENTAL MEDICINE
INSTITUT DE MEDECINE ENVIRONNEMENTALE
pour la défense

1133 Sheppard Avenue West, PO Box 2000, North York, Ontario, Canada M3M 3B9
Tel. (416) 635-2000 Fax. (416) 635-2104

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**INDIVIDUAL DIFFERENCES
IN DECISION MAKING:
ESTABLISHING COGNITIVE STYLE
NORMATIVE VALUES
FOR A MILITARY SAMPLE**

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Megan M. Thompson

Defence and Civil Institute of Environmental Medicine
1133 Sheppard Avenue West, P.O. Box 2000
Toronto, Ontario
Canada M3M 3B9

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EXECUTIVE SUMMARY

Cognitive styles are differences that document individuals' preferred information gathering and decision making styles. In the present research, a large-scale survey study was conducted to establish normative values of cognitive style variables for a military sample. Establishing the comparable nature of these samples is necessary for extrapolating to a military population the existing body of research using university samples. The military sample included 355 Canadian Forces personnel (276 males and 48 females -- 31 individuals did not list their gender). All branches of the CF (121 air, 191 land, 18 sea, 25 respondents did not report their uniform) were represented. The sample also included 61 commissioned officers, 18 officer cadets, and 276 individuals from the noncommissioned ranks. Military participants completed a variety of cognitive style measures during several mass testing sessions. These values were then compared to existing norms established for university samples in prior research.

Results of the descriptive and reliability analyses indicated that the cognitive styles of the military samples generally correspond with those obtained from university samples. ANOVAS and multiple comparison tests indicated that, overall, the officer sample was more similar to the university sample than was the sample drawn from the noncommissioned ranks. Potential reasons for differences found are noted. Future experimental applications of this area of inquiry are discussed.

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INTRODUCTION

Commanders in the military are called upon to make many decisions during the course of their daily duties. At higher levels, these decisions involve large numbers of personnel and equipment, and can engender significant risks and consequences. This is especially true during periods of war, but applies also to peacekeeping missions. Commanders must integrate large amounts of complex information while under time pressure, and in conditions that may vary continuously. Although such situations are an integral part of the duties of military personnel, to date little attention has been devoted to understanding the processes that underlie decision making in a military context.

Individual differences are psychological traits or cognitive styles that influence behavior in important ways (they have more recently been referred to as chronic tendencies to denote their more mutable aspects). Individual differences may be considered to play a role in how people generally react to the situations they encounter (i.e., a main effect hypothesis). Alternatively, as Larsson (1989) has suggested, individual differences may affect behavior only when paired with conditions of stress (i.e., a stress diathesis or interaction model). This interaction hypothesis may be more appropriate for decision making in the military where decisions are time-bounded, costly in terms of personnel and material, and where decisions are often made under poor environmental conditions such as sleep deprivation, inclement weather, or based on less than perfect information.

More generally, individual differences or cognitive styles, may be most prominent in decision making situations where they are hypothesized to directly affect knowledge seeking processes. As will be discussed below, past studies have demonstrated that cognitive styles have directly affected the timeliness and the manner in which decisions are made in a variety of domains.

The present work focuses upon the major cognitive styles cited in the recent decision-making literature: Personal Need for Structure (PNS) (Thompson, Naccarato, & Parker, 1992), Personal Fear of Invalidity (PFI) (Thompson et al., 1992), Need for Cognition (NFC) (Cacioppo & Petty, 1982; Cacioppo, Petty, & Kao, 1984), and Rigidity (Wesley, 1953). To date, several studies have been conducted which have established the psychometric utility and validity of each of these measures (Thompson et al., 1992; Cacioppo & Petty, 1982). However, most of this work has employed first-year university students as subjects. At present, the norms for a military sample are unknown, as is the relation among these scales or the pattern of findings between military and university samples. Establishing the comparable nature of these samples is a necessary prerequisite to extrapolating the existing body of research using university samples to a military population. In order to address this gap in the literature, the present study was conducted to provide cognitive style norms for a military sample. The goal of this project is to develop a relatively concise, reliable and valid research tool for use in future decision-making research for the military. For instance, one valuable application of this research would be to understand how cognitive styles influence individuals' decision-making strategies as well as their reactions to a variety of military stressors.

The Big Five Factor Inventory (see Borgatta, 1964; Digman, 1989; Digman & Takemoto-Chalk, 1981; Fiske, 1949; Goldberg 1990; Johns, 1990; Costa & McCrae, 1987; Norman, 1963; Peabody & Goldberg, 1989) lists characteristics representative of the five major dimensions of personality. This inventory was also included in the present research to further understand the relation of each of these tendencies to personality in general, and how cognitive styles may differ among the samples, (termed a multitrait-monomethod analysis, Pedhazur and Schmelkin, 1991). Together, this information will provide a benchmark for future decision making studies that incorporate cognitive style measures. A theoretical review of each cognitive style variable is presented prior to presentation of the normative study results.

PERSONAL NEED FOR STRUCTURE

A Need for Structure (NFS) is a need to have some guiding knowledge or answer on a topic; any answer being preferable to no answer at all (Thompson et al., 1992). In the past, NFS has been situationally induced usually via increased time pressure. Typically high NFS conditions have been shown to result in shorter reaction latencies, and greater confidence ratings of these decisions (e.g., Kruglanski & Freund, 1983). Recently, a personality measure, termed the Personal Need for Structure (PNS), designed to tap chronic levels of this construct has been developed (Thompson, Naccarato, & Parker, 1992; see also Neuberg, Judice, & West, 1997) [see Appendix A]. Accordingly, a person high in PNS would prefer clarity and structure in most situations, with ambiguity and grey areas proving troubling and uncomfortable. Indeed, it has been demonstrated that those scoring high in PNS were more likely to organize social and nonsocial information in simple less complex ways (as assessed by Q-sort techniques) (see Neuberg & Newsom, 1993). Moreover, studies have shown that high PNS individuals tend to rely on their previously existing stereotypes of target individuals when the target individual's recent behavior was ambiguous or inconsistent with their prior history (see also Kaplan, Wanshula, & Zanna, 1991; Moskowitz, 1993; Neuberg & Newsom, 1993; Thompson, Naccarato & Parker, 1992; 1998). In addition, those high in PNS have been shown to fulfill commitments earlier, attesting to their characteristic response to time pressure (Neuberg & Newsom, 1993, Roman, Moskowitz, Stein, & Eisenberg, 1994).

In their psychometric work on the PNS scale, Neuberg and Newsom (1993) isolated two separate factors. This first was termed the 'Desire for Structure'. Items on this subscale focused upon individuals preference for situations, activities that were structured and predictable. The second factor, 'The Response to a Lack of Structure' includes items indicating anxiety and/or discomfort when structure was perceived to be missing from situations encountered. Although Neuberg and Newsom isolated these two factors, to date there has been no psychometric work to determine the overlap and the differences between the two PNS dimensions. The present study represents the first effort to elucidate these distinctions.

PERSONAL FEAR OF INVALIDITY

Some individuals may react to decision-making situations by being more concerned with the possibility of making errors, and this may affect their decision-making strategies in significant ways. For example, a heightened concern with error can lead to vacillation between options, a

condition which is associated with longer response latencies and lessened subjective judgmental confidence (Kruglanski & Freund, 1983). A recently developed personality measure that taps chronic concerns with error, termed Personal Fear of Invalidity (PFI) (Thompson, et al., 1992; 1998; see also Neuberg, Judice, & West, *in press*), has been developed and is presented in Appendix B. This measure has been demonstrated to relate to more conflicted attitudes, regarding social issues (Thompson & Zanna, 1995; Thompson, Zanna, & Griffin, 1995), as well as a tendency to procrastinate in completing university assignments (Somers & Lefcourt, 1992). It is also expected that those high in PFI would show less confidence in the decisions that they make, have longer response latencies, and be more vulnerable or receptive to the effects of contradictory information, replicating the effects previously obtained with situational inductions of fear of invalidity (via evaluation apprehension).¹

NEED FOR COGNITION

A third personality variable that might affect military decision-making is Need for Cognition (NFC). As indicated by the NFC items listed in Appendix C, individuals with a high need for cognition enjoy and even seek out effortful cognitive tasks and consider such tasks as challenging rather than stressful encounters (Cacioppo & Petty, 1982). High need for cognition motivates people to search for a meaningful synthesis of decision-relevant information, with a goal of reconciling apparent inconsistencies into a meaningful and overarching understanding of a problem or issue. Past research concerning this construct has determined that high NFC is related to individuals perceiving themselves as effective problem solvers (Heppner, Reeder, & Larson, 1983), having higher levels of curiosity (Olson, Camp, & Fuller, 1984), and generating more complex explanations of behavior (attributional complexity) (Fletcher, Danilovics, Fernandez, Peterson, & Reeder, 1986). This link with cognitive complexity is important because there is evidence to suggest that such individuals are more able to reconcile apparently inconsistent information (Rosenbach, Crockett & Wapner, 1975; Press, Crockett, & Delia, 1975; Rosenkrantz & Crockett, 1965), which contributes to their perception of being effective problem solvers. Taken together, this literature suggests that those high in NFC typically endeavor to work through, understand, and bring coherence to a decision area.

The authors of the Need for Cognition scale have performed their own psychometric analyses and have established norms using university samples (see Cacioppo & Petty, 1982).

RIGIDITY

Wesley (1953) defines rigidity as a persistence in responses that may have been suitable in some situations but that no longer appear to be adequate to achieve current goals or to solve current problems. This personality construct is relevant to research in decision making because the tendency for rigidity should result in an inability to adapt to new or inconsistent information about an area. As well, rigidity could lead to an inability to reconcile inconsistencies, thereby impairing the decision-making process of these individuals.²

A second scale measures the degree of rigidity evident in one's personal habits, and is referred to as the Rigidity About Personal Habits scale or RAPH (Meresko, Rubin, Shantz, & Morrow,

1954). Items on this scale reflect a variety of experiential domains, including preference for art work, spontaneity versus careful planning of vacations, when meals are eaten and social activities. Individuals scoring high on the RAPH are thought to be resistant to change and less likely to modify their behaviors and personal habits even when it may be appropriate to do so (Meresko, et al., 1954). The central dimensions of the RAPH scale include traditionalism, rule boundedness, and discomfort/opposition to change. These scale items are presented in Appendix D.

THE “BIG FIVE” FACTOR MODEL OF PERSONALITY

The Big-Five Model of Personality (McCrae & Costa, 1989) and its related inventory (Johns, 1990) identifies the major components or dimensions of personality. Developed from structural analyses of traits people use to describe themselves and others, the “Big Five” organizes traits appearing in the natural language into overarching domains or categories. Thus, individuals’ self-reports or peer ratings on the Big Five Inventory provide a fairly complete and succinct assessment of the major components of personality with a minimum of effort and time. In the present study, the Big Five Inventory provides concurrent and construct validity, illuminating the differences between the cognitive style variables across our military and university samples.

Research on the stable aspects of personality has consistently indicated the presence of five recurring personality dimensions: Extroversion, Agreeableness, Conscientiousness, Neuroticism, and Openness (e.g. Borgatta, 1964; Digman, 1989; Digman & Takemoto-Chalk, 1981; Fiske, 1949; Goldberg 1990; Johns, 1990; Costa & McCrae, 1987; Norman, 1963; Peabody & Goldberg, 1989). Extroversion includes interpersonally based traits such as sociability, assertiveness, dominance, and the tendency to be outgoing versus reserved, aloof, shy, and solemn. The second factor, Agreeableness, is also interpersonal in nature and includes tendencies to be tolerant, cooperative, and warm versus malicious, harsh, irritable, and insincere. Factor Three, Conscientiousness, refers to such traits as thoroughness, persistence, predictability, rigidity and dependability versus carelessness, absent-mindedness, forgetful and erratic. Neuroticism refers to one’s emotional resilience, calmness, stability, confidence, and independence versus a tendency to be anxious, fearful, sensitive, and self-critical. The final component is Openness to Experience and includes tendencies to be intellectually complex, insightful, original, curious, and studious versus dull, illogical and narrow-minded (see Appendix E for the “Big Five” Factor Inventory). The “Big Five” Inventory is included in the present research in order to better establish the relation of cognitive style variables to more general personality dimensions, and to facilitate tests of convergent and divergent validity.

HYPOTHESES

Relation Among Cognitive Style Variables

Following from the literature outlined above, a Personal Need for Structure and Rigidity should be positively associated with each other, whereas both PNS and an Rrigidity should be negatively associated with Need for Cognition.

Interestingly, prior research (Thompson, Naccarato, & Parker, 1998) has suggested that there is a moderately positive correlation between PNS and PFI. For instance, high PNS and PFI might be expected to work in tandem in cases where one seeks out structure in order to clarify what is required in a situation, thereby lowering the likelihood of making an error. That is, one effective means of dealing with anxiety in a new and unfamiliar situation is to provide structure. This line of reasoning suggests that the correlation between PNS and PFI should be accounted for by the Response to Lack of Structure factor of the PNS scale. This same link between anxiety and structure also suggests that there may be a moderately positive correlation between PFI and Rigidity. Prior research has found that PFI was unrelated to Need for Cognition (Thompson and Zanna, 1995).

Relation of Cognitive Style and Big Five Variables

PNS and Rigidity should be positively related to conscientiousness and negatively associated with openness to experience. Examining the two factors of the PNS scale, we would expect that the first factor, Desire for Structure, might be reflected in a higher degree of Conscientiousness. Conversely the Response to Lack of Structure factor of the PNS scale might be more related to Neuroticism. Personal Fear of Invalidity should be related to higher levels of Neuroticism and negatively associated with an openness to experience. The focus upon errors that is characteristic of a high PFI might suggest that those high in PFI see themselves as careless as opposed to conscientious in their work. Need for Cognition should be positively associated with an Openness to experience and to the tendency to be thorough (Conscientiousness), and to a lack of Neuroticism. It is not immediately apparent how cognitive style variables may relate to Extroversion and Agreeableness. Indeed, there is no a priori reason to expect any relation between cognitive style and tendencies to be either sociable or cooperative.

Noncommissioned versus Officer Military Samples

Military personnel encompass diverse backgrounds. It is possible that this diversity could obscure important aspects of these cognitive style variables and their relation to one another. Thus, it may be more informative to divide the military sample into commissioned and non-commissioned ranks. These two groups plus a first year university sample form the three groups of investigation here. Overall, it was expected that the results of the sample of officers would more closely resemble those of the student sample as these two groups are more similar in terms of educational level. For instance, individuals with similar cognitive styles may be more likely to gravitate toward similar educational opportunities (e.g. those individuals with a high Need for Cognition would be more likely to pursue university degrees).

METHOD

MILITARY SAMPLE.

Subjects.

Subjects were preselected by the Base Personnel Selection Office at CFB Kingston in order to be representative of ranks and trades, and were tasked to attend the testing session. The sample included 276 males and 48 females (31 individuals did not list their gender), with an average age of 32.6 years (s.d. = 6.64), and an average of 13 years in the military (s.d. = 6.55, range 1 to 34 years). Our sample was drawn from each branch of the Canadian Forces (121 air, 191 land, 18 sea, 25 respondents did not report their uniform) and included 61 commissioned officers, 18 officer cadets, and 276 individuals from the noncommissioned ranks. Of the respondents who listed their educational level, 201 had a high school or equivalent education, 32 had attended college, and 95 had attended university. Of the university attendees, 23 respondents held bachelor degrees, 11 individuals had engineering degrees and 14 individuals had graduate degrees (Note that of the 355 respondents, 223 individuals failed to list a degree or diploma).

Procedure.

After assembling in a base auditorium that served as the testing site, subjects were told that their participation in the session was voluntary and were allowed to leave if they so choose. Only one of the 355 subjects declined to participate at this point. Questionnaires were available in either French or English. Subjects received a questionnaire package containing the cognitive style variables in a mass testing session. The subjects were given a brief introduction to the study and then given the following instructions:

On the next few pages we will be asking you to complete some questionnaires designed to look at the way you typically respond to everyday occurrences -- in particular your typical reactions to making decisions. Because these are established questionnaires by different authors, some questions are worded in a similar manner. At other times, even though the questions may seem to have similar meanings, some items refer to how you go about making decisions, while other refer to how you feel about making decisions ... Remember ... different people have different views and we are interested in what you personally think, how you personally feel, and what your typical experience has been. ... Note ... your name will not be linked with your data, thus ensuring the confidentiality of your answers ...

After completion of the questionnaire package personnel, subjects were thanked for their participation and dismissed.

UNIVERSITY SAMPLE.

Subjects and Procedure.

149 first year university students at the University of Arizona completed the questionnaires during mass testing sessions. Note that these questionnaires were completed in order to conduct other studies. For this reason, the Need for Cognition Scale was not included in the University of Arizona sample. In order to compare Need for Cognition results between the military and university students a further sample of 147 first year university students was included from the University of Waterloo, who also participated in a mass testing session.

RESULTS

OVERVIEW

A number of analyses were conducted in order to establish the normative values among the military sample for each of the cognitive style variables. First, reliability and descriptive analyses are presented for the two military samples (noncommissioned personnel and officers) as well as for the samples of first year university students. Next, Pearson's correlations were performed to investigate the empirical relation among the scales within each sample. Correlational findings are limited to the relation among cognitive style variables and their relation to the Big Five Factor scales (i.e., there will be no discussion of the interrelation among the Big Five Personality variables). Finally, a number of one way ANOVAs and multiple comparison analyses were conducted to determine if there were significant mean differences between the three samples.

DESCRIPTIVE AND RELIABILITY ANALYSES

Table 1 presents the results of the descriptive and reliability analyses performed on the military sample. Overall, the means and standard deviations for each of the measures were all mid-range values and comparable to values found in earlier studies using university students (see Thompson et al, 1993; Thompson & Zanna, 1995).

Insert Table 1 About Here

Cronbach's alphas, a measure of the internal consistency of the items comprising a scale, also presented in Table 1, ranged from a low .58 for the Rigidity scale in the officer sample to a robust .94 for the Need for Cognition Scale in the officer sample. Note that all the reliabilities (i.e., Cronbach's alpha) were acceptable, save for Rigidity in the two military samples which was somewhat lower for all samples and the Conscientiousness scale for the officer sample. Although the reasons for these somewhat lower reliability results are not clear, item analyses did not indicate any scale item to be particularly problematic.

PRELIMINARY CORRELATIONAL ANALYSES

Noncommissioned Ranks.

Preliminary correlational analyses conducted indicated that none of the cognitive style variables were strongly related to age (PNS: $r = .13$, ns; Desire for Structure, $r = .05$, ns; Response to Lack of Structure: $r = .13$, ns; PFI: $r = -.11$, ns; NFC: $r = .07$, ns; Rigidity: $r = .12$, ns), years of education (PNS: $r = -.09$, ns; Desire for Structure: $r = -.16$, $p = .02$; Response to Lack of Structure: $r = -.05$, ns; PFI: $r = .01$, ns; NFC: $r = -.03$, ns; Rigidity: $r = -.13$, ns), or years of military service (PNS: $r = .16$, $p = .01$; Desire for Structure: $r = .05$, ns; Response to Lack of Structure: $r = .17$, $p = .006$; PFI: $r = -.12$, $p = .06$; NFC: $r = .09$, ns; Rigidity: $r = .12$, ns) among noncommissioned personnel.

Officers.

A somewhat different pattern emerged between the cognitive style variables and the demographic variables in the sample of officers surveyed. Although PNS, Desire for Structure, Response to Lack of Structure and Rigidity continued to have little association to these demographic variables, there were significant correlations between both PFI and NFC with age, education years and years military service. Specifically, among officers, higher levels of NFC were associated with older respondents ($r = .30, p = .007$), and individuals who had more years of education ($r = .44, p < .001$), and more years of military service ($r = .31, p < .001$). Conversely, higher levels of PFI were associated with younger respondents ($r = -.32, p < .001$), and fewer years of military service ($r = -.31, p < .001$).

THE PATTERN OF RELATIONS AMONG VARIABLES WITHIN EACH SAMPLE

Note that in the following sections the discussion of Pearson correlational results will be limited to significant and or anomalous findings among the cognitive style and 'Big Five' variables. The additional results are available in the tables presented in this paper.

Noncommissioned Ranks.

As can be seen from Table 2, Pearson correlation results for the noncommissioned sample indicates that PNS is positively related to Rigidity ($r = .46, p < .001$), and Personal Fear of Invalidity ($r = .30, p < .001$). Further, PNS is negatively related to a Need for Cognition ($r = -.22, p < .001$).

Although the 12 item PNS was unrelated to any of the Big Five factors for the noncommissioned sample, the two subscales of the PNS scale were related in hypothesized ways to the Big Five. As expected, the Desire for Structure subscale was related to a tendency to be conscientious ($r = .24, p < .001$) and unrelated to neuroticism ($r = .02, ns$), while the Response to Lack of Structure subfactor was positively related to a tendency to be neurotic ($r = .27, p < .001$) and unrelated to conscientiousness ($r = .07, ns$). Contrary to previous research (e.g., Thompson & Zanna, 1996), higher need for cognition was related to less fear of invalidity ($r = -.38, p < .001$). Consistent with predictions however, high NFC was negatively associated

Insert Table 2 About Here

with Neuroticism ($r = -.32, p < .001$) and positively related to tendencies to be open to experience ($r = .37, p < .001$), and emotionally stable (or less neurotic ($r = -.32, p < .001$)). Further, high NFC was related to a tendency to be sociable or extroverted ($r = .21, p < .001$). Also as anticipated, PFI was related to greater Neuroticism ($r = .62, p < .001$) and tendencies to be less open to new experiences ($r = -.29, p < .001$), and less conscientious ($r = -.49, p < .001$). High PFI was also related to less self-reported agreeableness ($r = -.27, p < .001$).

Officers.

As was the case among the noncommissioned ranks, high PNS was associated with a greater Rigidity ($r = .43$, $p < .001$), and less need for Cognition ($r = -.23$, $p < .001$) among the officers surveyed. In this sample total scores on the PNS scale were unrelated to PFI ($r = .12$, ns) and all the Big Five factor scales. However, closer inspection of the PNS by factor yielded a pattern similar to that seen with the noncommissioned sample. That is, it was high scores on the Response to Lack of Structure factor of the PNS that accounted for the moderately positive relation to higher levels of PFI ($r = .22$, $p < .05$). Similar to the noncommissioned sample, high scores on the Desire for Structure factor was positively associated with Conscientiousness, but unrelated to Neuroticism, while high scores on the Response to Lack of Structure factor of the PNS scale was positively associated with Neuroticism ($r = .29$, $p < .001$), and not associated with Conscientiousness ($r = -.0008$, ns) although the former effect failed to reach statistical significance. In this sample high PFI was related to lower levels of NFC ($r = -.56$, $p < .001$), less conscientiousness ($r = -.68$, $p < .001$) and greater neuroticism ($r = .58$, $p < .001$). Somewhat surprisingly, NFC was unrelated to Rigidity ($r = -.03$, ns) among this sample. For officers a high need for cognition was also related to greater extroversion ($r = .29$, $p < .001$), agreeableness ($r = .46$, $p < .001$), conscientiousness ($r = .62$, $p < .001$) and openness to experience ($r = .21$, $p < .01$) and to less Neuroticism ($r = -.43$, $p < .001$).

University Students.

Table 2 also presents the correlations among cognitive style and Big Five variables for university students. Among this sample higher PNS again was related to a greater Rigidity ($r = .69$, $p < .001$) and higher levels of Personal Fear of Invalidity ($r = .32$, $p < .001$), and Neuroticism ($r = .31$, $p < .001$) and to less extroversion ($r = -.38$, $p < .001$) and less openness to experience ($r = -.41$, $p < .001$). For the university sample higher levels of Personal Fear of Invalidity were associated with lower levels of self-reported extroversion ($r = -.37$, $p > .001$), conscientiousness ($r = -.36$, $p < .001$) and openness to experience ($r = -.24$, $p < .001$) and to greater neuroticism ($r = .51$, $p < .001$).

Summary.

The general pattern of results is consistent across samples among cognitive style variables and between cognitive style variables and the Big Five variables. Moreover, the cognitive style variables were associated with the Big Five variables in a manner that was consistent with hypotheses. One difference did emerge however. Among officers PNS was unrelated to PFI, while there was a moderately positive relation between PFI and PNS for both the noncommissioned and the university samples.

MEAN DIFFERENCES AMONG SAMPLES

As illustrated in Table 3, results of the ANOVA and multiple comparison analyses indicated that noncommissioned personnel had a significantly higher mean level of personal need for structure ($M^{NC} = 3.97$) than did the group of officers ($M^{OFF} = 3.58$) or university students ($M^{US} = 3.59$), whose mean scores did not differ from each other ($F(2, 471) = 17.68, p < .001$). Not surprisingly, a similar pattern of results was evident for the Rigidity scale ($M^{NC} = 3.866, M^{OFF} = 3.62, M^{US} = 3.567; F(2, 469) = 21.87, p < .001$). There was also a significant difference between all groups in terms of levels of Need for Cognition ($F(2, 467) = 10.08, p < .001; M^{NC} = 5.48, M^{OFF} = 5.65, M^{US} = 5.09$). Unexpectedly, the university student sample reported the least Need for Cognition. With respect to mean levels of Personal Fear of Invalidity however ($F(2, 469) = 46.69, p < .001$), it was the university sample who had significantly higher levels of concern with error than either military sample ($M^{NC} = 3.083, M^{OFF} = 3.108$).

Insert Table 3 About Here

Of the Big Five Factor scales, significant differences between groups were recorded for four of the five factors: agreeableness ($F(2, 466) = 12.09, p < .001$), conscientiousness ($F(2, 466) = 59.82, p < .001$), Neuroticism ($F(2, 466) = 35.82, p < .001$) and openness ($F(2, 467) = 12.56, p < .001$). There were, however, no differences between the three groups in terms of extroversion ($F(2, 466) < 1.0, \text{ ns}$). More specifically, multiple comparison tests indicated that noncommissioned personnel rated themselves as significantly more agreeable ($M^{NC} = 3.99$) than did the university sample ($M^{US} = 3.68$) however there was no difference in agreeableness between the two military samples ($M^{OFF} = 3.84$), nor was there a significant difference between officers and the student sample on this dimension. All three groups differed significantly from each other in terms of conscientiousness ($M^{NC} = 4.19, M^{OFF} = 3.93, M^{US} = 3.50$). Interestingly, officers rated themselves as significantly more open to experience and creative ($M^{OFF} = 4.07$) than did either the noncommissioned ($M^{NC} = 3.76$) or the university samples ($M^{US} = 3.64$) who did not differ from one another. As might be expected from the prior PFI results, the university sample ($M^{US} = 2.98$) rated themselves as more neurotic than did either the noncommissioned or the officer samples ($M^{NC} = 2.36, M^{OFF} = 2.25$).

DISCUSSION

This research set out to establish normative values for cognitive style variables in military samples and to compare these norms with data collected on a university sample. Establishing the comparable nature of these samples is necessary for extrapolating the existing body of research using university samples to a military population. Results of the descriptive and reliability analyses indicated that the cognitive styles of the military samples generally correspond with those obtained from university samples. The pattern of correlations among cognitive style variables for the groups indicated that for both noncommissioned officers and university students there existed a moderately positive relation between PNS and PFI. This pattern failed to emerge among the officer sample. This relation was further demonstrated by the moderately positive relation between PNS and neuroticism that existed for the noncommissioned and university samples but did not appear in the officer sample. Only the university sample exhibited the expected negative relation between PNS and less openness to experience. Interestingly PNS was unrelated to openness for both the officer and noncommissioned samples here.

With respect to Need for Cognition, all correlations were in the expected directions. As hypothesized, higher concerns with error (measured by the PFI scale) were associated with greater neuroticism, and less conscientiousness. High PFI was related to less openness to experience for the university and the noncommissioned ranks only; there was no relation between these two variables for the officers sampled. Although the negative relation between Rigidity and openness to experience was demonstrated in the university sample, contrary to expectations, no relation existed between these two variables for either the officer or the noncommissioned samples.

The exploration of mean differences among cognitive style variables for the three samples was particularly informative. One way ANOVAS and multiple comparison tests indicated that there were mean differences among the two military and the university samples in terms of some cognitive styles. It was anticipated that officers would be more similar to university students in terms of cognitive styles due to more similar educational histories (i.e., more officers had attended university and post-graduate schools). This hypothesis received only partial support however. Consistent with hypotheses, noncommissioned personnel reported significantly higher mean levels of Personal Need for Structure and Rigidity than did either the officer or the university samples. This result makes intuitive sense as the lifestyle, and more particularly the "workstyle" of the noncommissioned ranks is one in which structure and rules dominate. It may be that there is a self-selection process at work here. That is, perhaps only people who seek out and embrace structure would be drawn to, and remain in the noncommissioned ranks.

Contrary to expectations, the university sample reported significantly lower levels of Need for Cognition than did the officer or the noncommissioned samples that did not differ in terms of mean levels of Need for Cognition. This result is more difficult to fathom. While it may reflect real differences between the groups, it may also be the case that the military samples were affected by response bias and social desirability concerns (see Pedhazur & Schmelkin, 1991) to a greater extent than was the university sample. For instance, members of the military samples

(but most specifically the noncommissioned sample) may be less used to personality measures used for research as opposed to clinical evaluation purposes, and may have been more reactive to (and suspicious of!) the presence of psychologist running a "personality" study. Pedhazur and Schmelkin (1991) suggest that the apprehensive responses are most likely to appear when respondents:

"perceive the researcher as having a high status (professional), having special training in evaluating people (e.g., psychologist), and/ or when performance appears to reflect on one's ability or personality (e.g., being told that research is about one's reasoning ability. ... subjects may be apprehensive about being perceived as ignorant (p. 238).

These concerns may have motivated at least some of the enlisted personnel to reject the notion that "It's enough for me that something gets the job done; I don't care how or why it works" or to more enthusiastically endorse items such as "I usually end up deliberating about issues even when they do not affect me personally".

The university sample was also more likely to report experiencing higher levels of Fear of Invalidity than did either of the military samples. Two possible reasons for this result appear plausible. First, there may be "socialization" (military versus civilian) differences. That is, the indecision and hesitation central to PFI are attributes that may be perceived as particularly negative within a military context as military training often centers upon decisiveness. Second, this result again may be best explained by some degree of social desirability concerns, at least on the part of the military sample.

Future research should be directed toward understanding the relation of these cognitive style variables to subjective (e. g., confidence and accuracy judgments) and objective (e. g., reaction time, calibration and objective accuracy) indices of decision-making. Moreover, studies should be directed toward continued explorations of the nature of the relation among these cognitive style variables. As mentioned in the introduction, one of the possible valuable applications of this cognitive style research is in understanding how various stressors may potentiate and/or ameliorate the effects of cognitive style variables on decision making strategies, timeliness, and accuracy. Indeed, it is here that our most interesting research questions and, more importantly, our most practical empirical answers may lie.

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FOOTNOTES

1. Psychometric analyses of the PFI scale have consistently yielded a single factor structure and Cronbach's alphas in the .80 range. Although overall there have been fewer empirical studies employing the PFI scale, psychometric results have been similar across studies.
2. As Rigidity scales have been found to have unstable reliabilities, two different rigidity scales have been combined.

Table 1: Descriptive and Reliability Analyses For Noncommissioned, Officer and University Samples

Sample Variable	Noncommissioned Ranks				Officers				University Sample			
	n	Mean	Std Dev	α	n	Mean	Std Dev	α	n	Mean	Std Dev	α
Personal Need For Structure (12 Items)	245	3.97	0.68	.77	78	3.58	0.71	.82	149	3.59	0.71	.82
Desire For Structure (4 Items)	245	4.35	0.84	.59	78	3.95	0.95	.75	149	3.89	0.93	.75
Response To Lack Of Structure (7 Items)	245	3.92	.82	.75	78	3.52	0.75	.73	149	3.61	0.77	.71
Need For Cognition 1	245	5.48	0.89	.83	78	5.65	1.28	.94	147	5.09	0.99	.85
Personal Fear Of Invalidity	245	3.08	0.66	.76	78	3.11	0.71	.76	149	3.75	0.73	.83
Rigidity	245	3.87	0.42	.59	78	3.62	0.43	.58	149	3.58	0.52	.73
Extroversion	243	3.48	0.71	.77	77	3.55	0.78	.79	149	3.45	0.82	.85
Agreeableness	243	3.99	0.55	.71	77	3.84	0.68	.75	149	3.68	0.67	.79
Conscientiousness	243	4.19	0.57	.77	77	3.93	0.65	.76	149	3.50	0.64	.77
Neuroticism	243	2.36	0.77	.82	77	2.25	0.66	.66	149	2.99	0.87	.84
Openness	244	3.76	0.58	.75	77	4.07	0.59	.78	149	3.64	0.67	.80

¹ Descriptive and Reliability results are from the University of Waterloo Sample.

Table 2: Correlations Among Cognitive Style Variables for Officers (N = 77), Noncommissioned Ranks (N = 238), and the University (N= 149) Sample

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Personal Need For Structure	--	.83 **	.91 **	--	.32 **	.69 **	-.38 **	-.06	.11	.31 **	-.41 **
2. Desire For Structure	.80 **/	--	.54 **	--	.23 **	.62 **	-.22 *	.006	.21 *	.14	-.35 **
3. Response To Lack Of Structure	.72 **	.91 **/	.51 **/	--	--	.34 **	.60 **	-.36 **	-.10	.02	.37 **
4. Need For Cognition	.92 **	.42 **	-.23 **/	-.06/	-.31 */	--	--	--	--	--	-.35 **
5. Personal Fear Of Invalidity	.12/	.03/	.22 #/	-.56 **/	--	.13	-.37 **	-.08	-.36 **	.51 **	-.24 **
6. Rigidity	.30 **	.09	.35 **	-.38 **	-.38 **/	.14/	--	-.32 **	.08	.33 **	.09
7. Extraversion	.02/	.21/	-.05 */	.29 **/	-.25 **/	.08/	--	.11	.17 #	-.44 **	.33 **
8. Agreeableness	-.14	.03	-.16 *	.31 **	-.42 **	-.18 *	--	--	--	--	--
9. Conscientiousness	-.04/	.10/	-.12/	.46 **/	-.33 **/	.12 /	.35 **/	--	.29 **	-.22 *	-.001
10. Neuroticism	-.13	-.10	-.12	.19 *	-.27 **	.09	.11	--	--	--	.02
11. Openness	.15/	.29 */	-.008/	.62 **/	-.68 **/	.23 #/	.44 **/	.47 **/	--	-.32 **	--
	.12	.24 *	.02	.41 **	-.49 **	.31**	.32 **	.41 **	--	-.49 **/	-.56 **/
	.11/	-.007/	.18/	-.43 **/	.58 **/	.04 /	-.26 #/	-.49 **/	--	--	-.22 *
	.23 *	.07	.27 **	-.32 **	.62 **	.11	-.39 **	-.42 **	-.52 **	--	--
	-.02/	.17/	-.07/	.21/	.02/	.07/	.25 */	.13/	.15/	-.19/	--
	-.10	.02	-.09	.37 **	-.29 ***	-.07	.40 **	.24 *	.35 **	-.29 **	--

Table 3: Mean Differences Between the Noncommissioned, Officer and University Samples

Variable	F Values	Noncoms Means (Std Err)	Officers Means (Std Err)	University Civilian Means (Std Err)
Personal Need For Structure	(2, 469) 17.68 **	A 3.97 (.043)	B 3.58 (.080)	B 3.59 (.058)
Desire For Structure	(2, 469) 14.54 **	A 4.35 (.054)	B 3.95 (.107)	B 3.87 (.076)
Response To Lack Of Structure	(2, 469) 11.63 **	A 3.92 (.053)	B 3.52 (.085)	B 3.60 (.063)
Need For Cognition 1	(2, 467) 44.73 **	A 5.48 (.057)	A 5.65 (.145)	B 4.59 (.081)
Rigidity	(2, 469) 21.87 **	A 3.87 (.027)	B 3.62 (.049)	B 3.57 (.043)
Personal Fear Of Invalidity	(2, 469) 46.69 **	A 3.08 (.042)	A 3.11 (.080)	B 3.75 (.060)
Extroversion	(2, 466) > 1.0, ns	3.48 (.046)	3.55 (.089)	3.46 (.068)
Agreeableness	(2, 466) 12.09, **	A 3.99 (.036)	AB 3.84 (.077)	B 3.68 (.0560)
Conscientious	(2, 466) 59.82 **	A 4.19 (.037)	B 3.93 (.074)	C 3.50 (.053)
Neuroticism	(2, 466) 35.82 **	A 2.36 (.049)	AB 2.25 (.075)	B 2.98 (.072)
Openness	(2, 467) 12.56 **	A 3.76 (.037)	B 4.07 (.068)	A 3.64 (.056)

Note: Means with different letters are significantly different at the .05 level. Means with the same letter are not significantly different from each other.

** - p < .001

1 - based on the University of Waterloo sample.

APPENDIX A: THE PERSONAL NEED FOR STRUCTURE SCALE

1 -	Strongly Disagree	4 -	Slightly Agree
2 -	Moderately Disagree	5 -	Moderately Agree
3 -	Slightly Disagree	6 -	Strongly Agree

-
-
1. _____ It upsets me to go into a situation without knowing what I can expect from it.
2. _____ I'm not bothered by things that upset my daily routine.
3. _____ I enjoy having a clear and structured mode of life.
4. _____ I like a place for everything and everything in its place.
5. _____ I like being spontaneous.
6. _____ I find that a well ordered life with regular hours makes my life tedious.
7. _____ I don't like situations that are uncertain.
8. _____ I hate to change my plans at the last minute.
9. _____ I hate to be with people that are unpredictable.
10. _____ I find that a consistent routine enables me to enjoy life more.
11. _____ I enjoy the exhilaration of being put in unpredictable situations.
12. _____ I become uncomfortable when the rules in a situation are not clear.

APPENDIX B: THE PERSONAL FEAR OF INVALIDITY SCALE

1 -	Strongly Disagree	4 -	Slightly Agree
2 -	Moderately Disagree	5 -	Moderately Agree
3 -	Slightly Disagree	6 -	Strongly Agree

1. _____ I may struggle with a few decisions but not very often.
2. _____ I never put off making important decisions.
3. _____ Sometimes I become impatient over my indecisiveness.
4. _____ Sometimes I see so many options to a situation that it is really confusing.
5. _____ I can be reluctant to commit myself to something because of the possibility that I might be wrong.
6. _____ I tend to struggle with most decisions.
7. _____ Even after making an important decision I continue to think about the pros and cons to make sure that I am not wrong.
8. _____ Regardless of whether others see an event as positive or negative I don't mind committing myself to it.
9. _____ I prefer situations where I do not have to decide immediately.
10. _____ I rarely doubt that the course of action I have selected will be correct.
11. _____ I tend to continue to evaluate recently made decisions.
12. _____ I wish I did not worry so much about making errors.
13. _____ Decisions rarely weigh heavily on my shoulders.
14. _____ I find myself reluctant to commit to new ideas but find little comfort in remaining with the tried and true.

APPENDIX C: THE NEED FOR COGNITION SCALE

8	very strong agreement	4	slight disagreement
7	strong agreement	3	moderate disagreement
6	moderate agreement	2	strong disagreement
5	slight agreement	1	very strong disagreement

1. I would prefer complex to simple problems.
2. I like to have the responsibility of handling a situation that requires a lot of thinking.
3. Thinking is not my idea of fun.
4. I would rather do something that requires little thought than something that is sure to challenge my thinking abilities.
5. I try to anticipate and avoid situations where there is likely the chance that I will have to think in depth about something.
6. I find satisfaction in deliberating hard and for long hours.
7. I only think as hard as I have to.
8. I prefer to think about small, daily projects to long term ones.
9. I like tasks that require little thought once I've learned them.
10. The idea of relying on thought to make my way to the top appeals to me.
11. I really enjoy a task that involves coming up with new solutions to problems.
12. Learning new ways to think doesn't excite me very much.
13. I prefer my life to be filled with puzzles that I must solve.
14. The notion of thinking abstractly is appealing to me.
15. I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought.
16. I feel relief rather than satisfaction after completing a task that required a lot of mental effort.
17. It's enough for me that something gets the job done; I don't care how or why it works.
18. I usually end up deliberating about issues even when they do not affect me personally.

APPENDIX D: THE RIGIDITY SCALE

1 -	Strongly Disagree	4 -	Slightly Agree
2 -	Moderately Disagree	5 -	Moderately Agree
3 -	Slightly Disagree	6 -	Strongly Agree

1. _____ I do not enjoy having to adapt myself to new and unusual situations.
2. _____ I prefer to stop and think before I act on even trifling matters.
3. _____ I would not like the kind of work which involves a large number of different activities.
4. _____ I usually find that one way of attacking a problem is best, even though it does not seem to work in the beginning.
5. _____ I dislike having to learn new ways of doing things.
6. _____ I am a methodical person in whatever I do.
7. _____ I am usually able to keep at a job longer than most people.
8. _____ I think that it is usually wise to do things in a conventional way.
9. _____ I always finish the tasks I start even if they are not important.
10. _____ People who go about their work methodically are almost always successful.
11. _____ When I have undertaken a task, I find it difficult to set it aside, even for a short amount of time.
12. _____ I am very conscientious about things such as locking doors and turning off lights.
13. _____ I have done many things on the spur of the moment.
14. _____ It is important to be prompt about appointments and the like.
15. _____ I usually dislike to set aside a task that I have undertaken until it is finished.
16. _____ I am inclined to go from one activity to another without continuing on any one for too long a time.
17. _____ I prefer to do things according to a routine which I plan myself.
18. _____ I like a great deal of variety in my work.
19. _____ An expert who doesn't come up with a definite answer probably doesn't know too much.
20. _____ It is more fun to tackle a complicated problem than to solve a simple one.
21. _____ I would like to live in a foreign country for a while.
22. _____ Many of our most important decisions are based upon insufficient information.

APPENDIX E: THE “BIG FIVE” FACTOR INVENTORY

Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who likes to spend time with others? Please write the number next to each statement to indicate the extent to which you agree or disagree with that statement.

1 Disagree Strongly	2 Disagree a Little	3 Neither Agree nor Disagree	4 Agree a Little	5 Agree Strongly
---------------------------	---------------------------	------------------------------------	------------------------	------------------------

I See Myself as Someone Who ...

Factor 1: Extroversion

1. _____ Is talkative
6. _____ Is reserved
11. _____ Is full of energy
16. _____ Generates a lot of enthusiasm
21. _____ Tends to be quiet
26. _____ Has an assertive personality
31. _____ Is sometimes shy, inhibited
36. _____ Is outgoing sociable

Factor 2: Agreeable

2. _____ Tends to find fault with others
7. _____ Is helpful and unselfish with others
12. _____ Starts quarrels with others
17. _____ Has a forgiving nature
22. _____ Is generally trusting
27. _____ Can be cold and aloof
32. _____ Is considerate and kind to almost everyone
37. _____ Is sometimes rude to others
42. _____ Likes to cooperate with others

Factor 3: Conscientiousness

3. _____ Does a thorough job
8. _____ Can be somewhat careless
13. _____ Is a reliable worker
18. _____ Tends to be disorganized
23. _____ Tends to be lazy
28. _____ Perseveres until task is finished
33. _____ Does things efficiently
38. _____ Makes plans and follows through with them
43. _____ Is easily distracted

Factor 4: Neuroticism

4. _____ Is depressed, blue
9. _____ Is relaxed, handles stress well
14. _____ Can be tense
19. _____ Worries a lot
24. _____ Is emotionally stable
29. _____ Can be moody
34. _____ Remains calm in tense situations
39. _____ Gets nervous easily

Factor 5: Openness

5. _____ Is original
10. _____ Is curious about many different
15. _____ Is igneous, a deep thinker
20. _____ Has an active imagination
25. _____ Is inventive
30. _____ Values artistic, aesthetic experiences
35. _____ Prefers work that is routine
40. _____ Likes to reflect, play
41. _____ Has few artistic interests
44. _____ Is sophisticated in art, music, or literature

Please check: Did you write a number in front of each statement?

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Cognitive styles are differences that document individuals' preferred information gathering and decision making styles. In the present research, a large-scale survey study was conducted to establish normative values of cognitive style variables for a military sample. Establishing the comparable nature of these samples is necessary for extrapolating to a military population the existing body of research using university samples. The military sample included 355 Canadian Forces personnel (276 males and 48 females -- 31 individuals did not list their gender). All branches of the CF (121 air, 191 land, 18 sea, 25 respondents did not report their uniform) were represented. The sample also included 61 commissioned officers, 18 officer cadets, and 276 individuals from the noncommissioned ranks. Military participants completed a variety of cognitive style measures during several mass testing sessions. These values were then compared to existing norms established for university samples in prior research.

Results of the descriptive and reliability analyses indicated that the cognitive styles of the military samples generally correspond with those obtained from university samples. ANOVAS and multiple comparison tests indicated that, overall, the officer sample was more similar to the university sample than was the sample drawn from the noncommissioned ranks. Potential reasons for differences found are noted. Future experimental applications of this area of inquiry are discussed.

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Decision Making, Individual Differences, Cognitive Styles, Normative Values, Military vs. Civilian Student Norms